CLAIMS

1. A method for receiving an MPEG2 transport stream (TS) in a real-time protocol (RTP)/user datagram protocol (UDP)/Internet protocol (IP) packet, the method comprising:

receiving an IP packet via an IP network, having a variable transmission delay;

accessing a timestamp carried in a RTP packet;

linking the timestamp with a program clock reference (PCR) MPEG2TS carried in the RTP packet payload; and,

using the timestamp to eliminate variable transmission delay jitter, associated with the PCR MPEG2TS.

2. The method of claim 1 wherein accessing the timestamp carried in the RTP packet includes accessing a timestamp having a resolution of greater than 500 nanoseconds (ns); and,

wherein using the timestamp to eliminate variable transmission delay jitter, associated with the PCR MPEG2TS, includes reducing the jitter to less than 500 ns.

3. The method of claim 1 wherein accessing a timestamp carried in the RTP packet includes accessing a RTP timestamp carried in a RTP packet header.

4. The method of claim 3 wherein linking the timestamp with a PCR MPEG2TS carried in the RTP packet payload includes linking

the RTP timestamp with a solitary PCR MPEG2TS carried in the RTP packet payload.

5. The method of claim 3 wherein linking the timestamp with a PCR MPEG2TS carried in the RTP packet payload includes linking the RTP timestamp with a PCR MPEG2TS immediately following the RTP packet header.

6. The method of claim 1 further comprising:

accessing an index field in the RTP packet header; and,

wherein linking the timestamp with a PCR MPEG2TS carried in the RTP packet payload includes using the index to point to a PCR MPEG2TS randomly positioned in the RTP packet payload.

7. The method of claim 6 wherein accessing an index field in the RTP packet header includes accessing a timestamp packet index field; and,

wherein linking the timestamp with a PCR MPEG2TS carried in the RTP packet payload includes using the timestamp packet index to link an RTP timestamp to a PCR MPEG2TS randomly positioned in the RTP packet payload.

8. The method of claim 6 wherein accessing an index field in the RTP packet header includes accessing a PCR MPEG2TS index field;

wherein accessing a timestamp carried in the RTP packet includes accessing a PCR MPEG2TS timestamp carried in a RTP packet header; and,

wherein linking the timestamp with a PCR MPEG2TS carried in the RTP packet payload includes using the PCR MPEG2TS index to point to a PCR MPEG2TS randomly positioned in the RTP packet payload.

9. The method of claim 1 wherein accessing a timestamp carried in the RTP packet includes accessing a local timestamp field in an MPEG2TS delay compensation data structure, where the MPEG2TS delay compensation data structure is carried in the RTP packet payload and includes the local timestamp and a corresponding PCR MPEG2TS; and,

wherein linking the timestamp with a PCR MPEG2TS carried in the RTP packet includes linking the local timestamp to the corresponding PCR MPEG2TS in the MPEG2TS delay compensation data structure.

10. The method of claim 9 wherein accessing a local timestamp field in an MPEG2TS delay compensation data structure includes accessing a local timestamp field in each of a plurality of MPEG2TS delay compensation data structures carried in the RTP packet payload, where the MPEG2TS delay compensation data structures include an MPEG2TS selected from the group including PCR and non-PCR MPEG2TSs;

wherein linking the timestamp with a PCR MPEG2TS carried in the RTP packet payload additionally includes linking local timestamps with corresponding non-PCR MPEG2TSs; and,

wherein using the timestamp to eliminate variable transmission delay jitter, associated with the PCR MPEG2TS, additionally includes using the local timestamps to eliminate jitter associated with corresponding non-PCR MPEG2TSs.

11. The method of claim 1 wherein using the timestamp to eliminate variable transmission delay jitter, associated with the PCR MPEG2TS, includes using the timestamp to determine the target transmission time of the PCR MPEG2TS.

12. A method for transmitting an MPEG2 transport stream (TS) in a real-time protocol (RTP)/user datagram protocol (UDP)/Internet protocol (IP) packet, the method comprising:

encapsulating a program clock reference (PCR) MPEG2TS in the RTP packet payload;

encapsulating a timestamp in a RTP packet, referencing the PCR MPEG2TS target transmission time;

encapsulating the RTP packet in an IP packet; and,

transmitting the IP packet via an IP network.

13. The method of claim 12 wherein encapsulating a timestamp in a RTP packet, referencing the PCR MPEG2TS, includes

encapsulating a timestamp having a resolution of greater than 500 nanoseconds (ns).

14. The method of claim 12 wherein encapsulating a timestamp in a RTP packet includes encapsulating an RTP timestamp in the RTP packet header.

15. The method of claim 14 wherein encapsulating a PCR MPEG2TS in the RTP packet payload includes encapsulating a solitary PCR MPEG2TS in the RTP packet payload.

16. The method of claim 14 wherein encapsulating a PCR MPEG2TS in the RTP packet payload includes encapsulating the PCR MPEG2TS in the RTP packet payload, immediately following the RTP header.

17. The method of claim 12 wherein encapsulating a PCR MPEG2TS in the RTP packet payload includes encapsulating a PCR MPEG2TS randomly positioned in the RTP packet payload; and,

the method further comprising:

encapsulating an index in the RTP packet header pointing to the position of the MPEG2TS in the RTP packet payload.

18. The method of claim 17 wherein encapsulating a timestamp in a RTP packet includes encapsulating an RTP timestamp in the RTP packet header; and,

wherein encapsulating an index in the RTP packet header includes encapsulating a timestamp packet index in the RTP packet header.

19. The method of claim 17 wherein encapsulating a timestamp in the RTP packet includes encapsulating a PCR MPEG2TS timestamp; and,

wherein encapsulating an index in the RTP packet header includes encapsulating a PCR MPEG2TS index field in the RTP packet header.

20. The method of claim 12 wherein encapsulating a PCR MPEG2TS in the RTP packet payload includes encapsulating the PCR MPEG2TS in an MPEG2TS delay compensation structure, carried in the RTP packet payload; and,

wherein encapsulating a timestamp in the RTP packet includes encapsulating a local timestamp in the MPEG2TS delay compensation data structure, referencing the co-encapsulated PCR MPEG2TS.

21. The method of claim 20 wherein encapsulating the PCR MPEG2TS in an MPEG2TS delay compensation structure includes encapsulating a plurality of MPEG2TSs, selected from the group including PCR MPEG2TSs and a non-PCR MPEG2TSs, in a corresponding plurality of MPEG2TS delay compensation structures; and,

wherein encapsulating a local timestamp field in the MPEG2TS delay compensation data structure includes encapsulating a local timestamp field in each MPEG2TS delay compensation structure, referencing a co-encapsulated MPEG2TS.

22. A system for receiving an MPEG2 transport stream (TS) in a real-time protocol (RTP)/user datagram protocol (UDP)/Internet protocol (IP) packet, the system comprising:

a receiver having an IP network interface to receive an IP packet via an IP network, having a variable transmission delay, and an interface to supply a RTP packet; and,

a de-jitter module having an interface to accept the RTP packet, the de-jitter module accessing a timestamp carried in a RTP packet, linking the timestamp with a program clock reference (PCR) MPEG2TS carried in the RTP packet payload, and using the timestamp to eliminate variable transmission delay jitter, the de-jitter module having an interface to supply the PCR MPEG2TS with a constant delay.

23. The system of claim 22 wherein the de-jitter module accesses a timestamp having a resolution of greater than 500 nanoseconds (ns) and supplies a PCR MPEG2TS with a jitter of less than 500 ns.

24. The system of claim 22 wherein the de-jitter module accesses a RTP timestamp carried in a RTP packet header.

25. The system of claim 24 wherein the de-jitter module links the RTP timestamp with a solitary PCR MPEG2TS carried in the RTP packet payload.

26. The system of claim 24 wherein the de-jitter module links the RTP timestamp with a PCR MPEG2TS immediately following the RTP packet header.

27. The system of claim 24 wherein the de-jitter module accesses a timestamp packet index field in the RTP packet header and uses the timestamp packet index to point to a PCR MPEG2TS randomly positioned in the RTP packet payload.

28. The system of claim 22 wherein the de-jitter module accesses a PCR MPEG2TS index field in the RTP packet header, accesses a PCR MPEG2TS timestamp carried in a RTP packet header, uses the PCR MPEG2TS index to point to a PCR MPEG2TS randomly positioned in the RTP packet payload, and uses the PCR MPEG2TS timestamp to eliminate variable transmission delay jitter.

29. The system of claim 22 wherein the de-jitter module accesses a local timestamp field in an MPEG2TS delay compensation data structure, where the MPEG2TS delay compensation data structure is carried in the RTP packet payload and includes the local timestamp and a corresponding PCR MPEG2TS, and links the local timestamp to the

corresponding PCR MPEG2TS in the MPEG2TS delay compensation data structure.

30. The system of claim 29 wherein the de-jitter module accesses a local timestamp field in each of a plurality of MPEG2TS delay compensation data structures carried in the RTP packet payload, where the MPEG2TS delay compensation data structures include an MPEG2TS selected from the group including PCR and non-PCR MPEG2TSs, links local timestamps with corresponding non-PCR MPEG2TSs, and uses the local timestamps to eliminate jitter associated with corresponding non-PCR MPEG2TSs.

31. The method of claim 22 wherein the de-jitter module uses the timestamp to determine the target transmission time of the PCR MPEG2TS.

32. A system for transmitting an MPEG2 transport stream (TS) in a real-time protocol (RTP)/user datagram protocol (UDP)/Internet protocol (IP) packet, the system comprising:

an encapsulation module having an interface to accept a program clock reference (PCR) MPEG2TS, the encapsulating module encapsulating the PCR MPEG2TS in a RTP packet payload, encapsulating a timestamp in a RTP packet referencing the PCR MPEG2TS target transmission time, encapsulating the RTP packet in an IP packet, and supplying the IP packet at an interface; and,

a transmitter having an interface to accept the IP packet and an interface to transmit the IP packet via an IP network.

33. The system of claim 32 wherein the encapsulation module encapsulates a timestamp having a resolution of greater than 500 nanoseconds (ns).

34. The system of claim 32 wherein the encapsulation module encapsulates an RTP timestamp in the RTP packet header.

35. The system of claim 34 wherein the encapsulation module encapsulates a solitary PCR MPEG2TS in the RTP packet payload.

36. The system of claim 34 wherein the encapsulation module encapsulates the PCR MPEG2TS in the RTP packet payload, immediately following the RTP header.

37. The system of claim 34 wherein the encapsulation module encapsulates a PCR MPEG2TS randomly positioned in the RTP packet payload and encapsulates a timestamp packet index in the RTP packet header pointing to the position of the MPEG2TS in the RTP packet payload.

38. The system of claim 32 wherein the encapsulation module encapsulates a PCR MPEG2TS randomly positioned in the RTP

packet payload, encapsulates a PCR MPEG2TS timestamp, and encapsulates a PCR MPEG2TS index field in the RTP packet header pointing to the position of the MPEG2TS in the RTP packet payload.

39. The system of claim 32 wherein the encapsulation module encapsulates the PCR MPEG2TS in an MPEG2TS delay compensation structure, carried in the RTP packet payload, and encapsulates a local timestamp in the MPEG2TS delay compensation data structure, referencing the co-encapsulated PCR MPEG2TS.

40. The system of claim 39 wherein the encapsulation module receives and encapsulates a plurality of MPEG2TSs, selected from the group including PCR MPEG2TSs and a non-PCR MPEG2TSs, in a corresponding plurality of MPEG2TS delay compensation structures, and encapsulates a local timestamp field in each MPEG2TS delay compensation structure, referencing a co-encapsulated MPEG2TS.